

## Environment, Safety, and Health

NREL has always been committed to protecting the environment and preserving the health and safety of individuals and the community. These commitments have the highest priority when planning and conducting Laboratory activities. Recent changes in the organization of the Laboratory and the way it conducts business were seen as opportunities to improve the effectiveness and efficiency of the Environment, Safety, and Health (ES&H) programs through the next 5 years.

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The primary basis for these improvements is the strong ES&H culture that exists in the Laboratory. This culture will continue to grow through continuous involvement of all staff in ES&H activities, and recognition that the person doing the work is the most knowledgeable of hazards and how to control them. Staff will be increasingly involved in the active application of risk management concepts to ensure that the controls implemented are appropriate and make the best use of available resources. In all cases the ES&H programs are performance- and outcome-based, with ongoing monitoring of results determining future actions. While compliance with all applicable regulatory requirements is inherent in the programs, it will be achieved through proactive and innovative methods.

Significant changes have been implemented and will continue to develop in the coordination of ES&H with other management functions. Through involvement with the Business Council and R&D Council, the management of ES&H issues has become better integrated in day-to-day operations.

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This process will continue, with the objective of ES&H considerations being an automatic part of all Laboratory activities. Incorporating ES&H at all levels and stages of management not only makes ES&H a proactive and cost-effective function, but also prepares the ES&H

programs to accommodate new types of research work with minimal programmatic impact. Proper coordination is necessary to prevent unnecessary or duplicative efforts. The ES&H Office at NREL serves the function of gatekeeper for this coordination, and also provides necessary technical support and expertise.

### ***Laboratory ES&H Goals***

Protection of the environment, persons, and property are overriding ES&H goals for the Laboratory, as a matter of policy. Laboratory-wide ES&H goals are established each year by the NREL Safety

Council, with the goals being matched to needs and risks identified through council oversight activities. The goals are implemented Laboratory-wide via balanced scorecards at various levels of the Laboratory (see Volume I, Performance-Based Management), thereby ensuring they are integrated at all levels of the organization. The FY 1996 ES&H goals focused on minimization of injuries and illnesses, and all centers developed their own goals and proactive measures in support of this Laboratory-wide goal. The targets were very aggressive and all were met or exceeded. Goals established for FY 1997 address further minimization of injuries and illnesses, and completion of an internal risk-assessment audit. All centers will again participate through development of proactive goals and measures appropriate to their activities.

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The balanced scorecard has proven to be an effective mechanism for carrying ES&H goals throughout the organization, and stimulates proactive measures that extend to the individual worker level. It also allows the ES&H goals to be matched and balanced with other issues within the Laboratory, such as budgets, research objectives, and business development.

### ***Safety Council, Subcommittees, and Panels***

The NREL Safety Council and its subcommittees were revised during FY 1996 to better match the new organizational structure of the Laboratory, and to allow active ES&H participation in the integrated management process. Safety Council membership is now made up of representatives of R&D Council, Business Council, Staff Council, the building area engineers (BAEs), and senior management. This combination allows input by and coordination with all levels of staff, functional areas, and decision-making bodies within the Lab.

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Six subcommittees are chaired by the BAEs and cover their assigned geographical areas. This allows information to be exchanged and issues to be raised and resolved by the general staff at a local level. Safety panels made up of subject matter experts address specialized risk areas such as lasers or hazardous production

materials. All of the subcommittees and panels communicate with the Safety Council on a regular basis and forward issues for resolution when necessary. This overall structure allows issues and concerns to be raised to the appropriate level for action with full staff participation, and resolutions are coordinated across the Laboratory via linkages existing with the other councils.

The Safety Council establishes Laboratory ES&H goals, monitors performance against those goals, and reports that performance through various self-assessments. Lessons learned by the Safety Council are incorporated into current activities.

## ***Risk Assessment***

The assessment and management of risk has become a critical tool for successful ES&H performance in private industry, and NREL continues to aggressively tailor its programs to provide the most effective and efficient control of risks. NREL's risk assessment process traces its roots to the earliest days of the Laboratory, and is based on formal ES&H documents providing guidance for routine activities and Safe Operating Procedures (SOPs) for unique activities. Safety Analysis Reviews

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(SARs) are also conducted for activities having potential off-site impacts. Through these processes all research and development (R&D) and support activities are maintained at "low" levels of risk, per industry definitions. As activities covered by specific SOPs or SARs become more common, they are being

incorporated into standard ES&H documents. The resulting reduction in the number of SOPs and SARs during the past few years has allowed better use of research staff time without compromising ES&H effectiveness.

Other recent improvements that will be continued include an increasing number of mid-level reviews based on Process Hazard Analysis (PHA) concepts. Line staff are participating in these analyses after being trained in the PHA process. This allows their knowledge of the work and the hazards to be matched with necessary assessment skills, and increases cross-organizational sharing of risk-assessment capabilities. There has also been an increased focus on proactive risk assessment to ensure that necessary controls are identified during the experimental design phase. Fewer interruptions of R&D programs and design of cost-effective controls are results of this proactive approach. The emphasis on staff involvement and proactive evaluations will continue during future years.

To ensure that there are no troublesome synergistic effects created by multiple R&D activities in a single facility, vulnerability analyses were conducted for each facility during FY 1995. As an extension of this process a Laboratory ES&H goal has been established for FY 1997 to ensure that all activities conducted

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within a facility have been subjected to the proper level of risk assessment. Each center is developing coordinated goals and measures through its balanced scorecard. Corrective actions will be implemented where identified as necessary, and the results of this Laboratory-wide activity will determine what risk assessment process improvements are required for future years.

Another proactive aspect of risk assessment and management is the revision of the ES&H Inspection Program during FY 1996. The program now matches the new organizational structure, and makes better use of the substantial pool of ES&H knowledge possessed by the general staff. The inspections are conducted by cross-organizational teams, and focus on sharing functional knowledge in addition to identifying deficiencies. The inspections are coordinated by the building area engineers and trends are shared during Safety Subcommittee meetings.

## ***Control of Injuries and Illnesses***

Injuries and illnesses have a negative impact on the Laboratory due to reductions of productivity and staff well-being, as well as costs incurred. Worker's compensation case management is being aggressively applied to minimize these impacts on the Lab and the individuals, and all efforts will be made to stay at the leading edge of this field.

Components of this program include case management by in-house staff, continuous trending and analysis of injuries and costs, communication of findings to staff via the Safety Council, and development and implementation of corrective actions. These activities allow limited resources to be applied

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to the true areas of need and focus on the well-being of the staff, thereby improving overall cost-effectiveness. Injury and illness performance results are closely monitored and have historically exceeded all baselines available. These processes will continue with upgrades and improvements as appropriate due to the significant impact that injuries and illnesses can have.

To enhance Lab-wide participation, goals and measures for the control of injuries and illnesses were established via the FY 1996 balanced scorecard, and will continue through FY 1997 and later years. A significant piece of this activity is the implementation of proactive measures to prevent these incidents from occurring or from becoming more severe when they do occur.

## ***Worksmart Process***

During FY 1996 NREL initiated the process of identifying and adopting the set of ES&H standards best suited to the work performed at the Lab. This process, known as Worksmart, was provided by DOE and has multiple benefits. In addition to ensuring that the standards adopted are necessary and sufficient for the hazards present, the process prevented unnecessary or burdensome standards from

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being applied. It also provided an opportunity to evaluate the hazards actually present, in effect a real-time internal assessment, with participation by the entire staff in the hazard identification process. Smaller sets of staff

with specific technical qualifications served as subject matter experts during the selection of standards to match the identified hazards. These methodologies make use of the fact that the persons performing the work are the most knowledgeable of the hazards and how to control them, and further serve to make ES&H an ingrained part of all activities.

The identified set of standards will be implemented during FY 1997, with continuous review and improvement processes for outlying years. Implementation will be closely coordinated with the Lab-wide goal of evaluating the Laboratory risk-assessment process, which is representative of the overlap and integration of all ES&H activities.

## ***Environmental Management***

NREL continues its strong commitment to protection of the environment, during both Laboratory operations and transfer of technology to industry. Environmental management in previous years included completion of baseline monitoring and environmental assessments at all NREL sites, obtaining the appropriate permits for current operations, and identifying and implementing necessary hazard controls for R&D activities. These activities will continue at appropriate levels, with needs being identified via program oversight, the environmental component of the risk assessment process, and continuous review of regulatory requirements.

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**Two environmental program areas have been identified for further development during the next 5 years... minimizing internal waste and downstream environmental impact from NREL technologies.**

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Two environmental program areas have been identified for further development during the next 5 years. The first involves improvements to the internal waste minimization programs, the goal being to increase the effectiveness of the mechanisms already in place. As with other ES&H programs, the success of this effort will hinge on effective integration into Laboratory-wide activities. The second is ensuring that technology transferred to industry has as little downstream environmental impact as possible. Mechanisms that may positively affect environmental impact during implementation of new technologies are proactive application of waste minimization considerations to the R&D process, and incorporation of International Standards Organization 14000 environmental management standards. These mechanisms will be actively pursued to determine their feasibility, effectiveness, and potential contribution to NREL's strategic plan.